pacific ENSO update

2nd Quarter, 2006 Vol.12, No.2 ISSUED: MAY 18, 2006

A Bulletin of the Pacific El Niño-Southern Oscillation (ENSO) Applications Center:
University of Guam • University of Hawaii • NOAA • Pacific Basin Development Council
www.soest.hawaii.edu/MET/Enso

*The **Pacific ENSO Update** is a bulletin of the **Pacific El Niño-Southern Oscillation (ENSO) Applications Center (PEAC).** PEAC conducts research & produces information products on climate variability related to the ENSO climate cycle in the U.S.-affiliated Pacific Islands (USAPI). This bulletin is intended to supply information for the benefit of those involved in such climate-sensitive sectors as civil defense, resource management, and developmental planning in the various jurisdictions of the USAPI.*

The Pacific ENSO Update is produced quarterly both online and in hard copy, with addition special reports on important changes in ENSO conditions as may be required from time to time. For more information about this issue please contact the editor, Nicole Colasacco at nicole.colasacco@noaa.gov or at the address on the last page of this newsletter.

CURRENT CONDITIONS

Many of the islands of Micronesia typically enter their dry season at the start of the calendar year; and on some islands (especially those north of 10º N), the dry season persists until June or July. On islands located further to the south, abundant rains occur throughout the entire year. The rainfall distribution in Micronesia during the first three months of 2006 was characterized by a sharp north-south gradient (north dry, south wet) superimposed on a gradual east-west gradient (east dry, west wet) related to La Niña circulation anomalies and an active Australian Northwest Monsoon. There was **abundant rainfall south of roughly 7ºN** (for example, Kosrae), and **very dry conditions at some islands north of 8ºN** (for example, the northern Marshall Islands) (**Fig. 1a, 1b**). The first quarter rainfall totals were generally highest in the southernmost islands of each State. Yap State was drier than normal except at Woleai, which is furthest south. Chuuk State was generally drier than normal except in some of the Mortlocks, which are further south. In Pohnpei State, locations furthest north (such as some of the sites on Pohnpei Island) were moderately dry, whereas islands further to the south (such as Nukuoro and Kapingamarangi) were wetter. Kosrae and the Republic of Palau had abundant rains. Guam and the CNMI started off wet in January and February then were very dry in March and April. Rainfall in American Samoa was phenomenal during February when a vigorous northwest monsoon persisted in the area, and some tropical cyclones passed nearby as they moved southeastward along the axis of the monsoon trough. When the northwest monsoon retreated westward in March, the rainfall in Samoa was much lower, and tropical cyclone activity shifted westward into the Coral Sea and the top end of Australia. First quarter rainfall totals were less than 80% of normal at some locations within Chuuk State, the northern RMI, Yap State, CNMI and on Guam. First quarter rainfall totals in excess of 120% of normal occurred in some of the southernmost islands of Chuuk State, Pohnpei State, and the RMI; and exceeded 120% of normal throughout Palau and American Samoa. The highest First Quarter rainfall total recorded in Micronesia was the 62.20 inches at Utwa on Kosrae; Nukuoro and the Palau International Airport followed next with 46.76 inches and 46.58 inches, respectively. The lowest recorded First Quarter rainfall total in Micronesia was the 7.12 inches at Wotje in the northern RMI, where all reporting locations indicated less than 10 inches for the 3-month period.

Dry conditions are anticipated to continue throughout much of Micronesia in the northernmost locations that were dry in the 1stQuarter. The trade wind trough has been re-established over southern Micronesia, and rainfall should be abundant in most areas south of 8ºN by the end of April, for areas south of 10ºN by the end of May, and for the Mariana Islands by the end of July. **Residents in the northern Marshall Islands are encouraged to conserve water until the rains return.** For most of Micronesia, the dry season has ended, but for some locations, the wet season has not yet begun.

Publication of the **Pacific ENSO Update** *is supported by the National Oceanic and Atmospheric Administration (NOAA), National Weather Service-Pacific Region Headquarters. The views expressed herein are those of the author(s) and do not necessarily reflect the views of NOAA, any of its sub-agencies, or cooperating organizations.*

cont'd on page 2

CURRENT CONDITIONS

These areas (Yap, CNMI, Guam and northern RMI) are in the transition to the wet season. Rainfall in American Samoa should remain near normal now that the Northwest Monsoon is over and the South Pacific Convergence Zone has moved away from the islands.

Most of the statistical and coupled model forecasts indicate **ENSO neutral conditions** in the tropical Pacific **through the end of 2006**. The spread of the most recent statistical and coupled model forecasts (weak La Niña to weak El Niño) indicates **uncertainty in the outlooks for the last half of the year**. Current conditions (stronger-than-average easterly winds over the central equatorial Pacific and slightly cooler Eastern Pacific sea surface temperatures) indicate some residual weak La Nina conditions lingering, however most of the statistical and coupled models show this trend weakening further and predict ENSO neutral for the next three to six months. The synopsis from the CPC EL NIÑO/ SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION posted on the U.S. Climate Prediction Center web site on May 11, 2006 was for "***ENSO-neutral conditions are expected to prevail during the next 3-6 months***" (see p. 12) .

CURRENT CONDITIONS

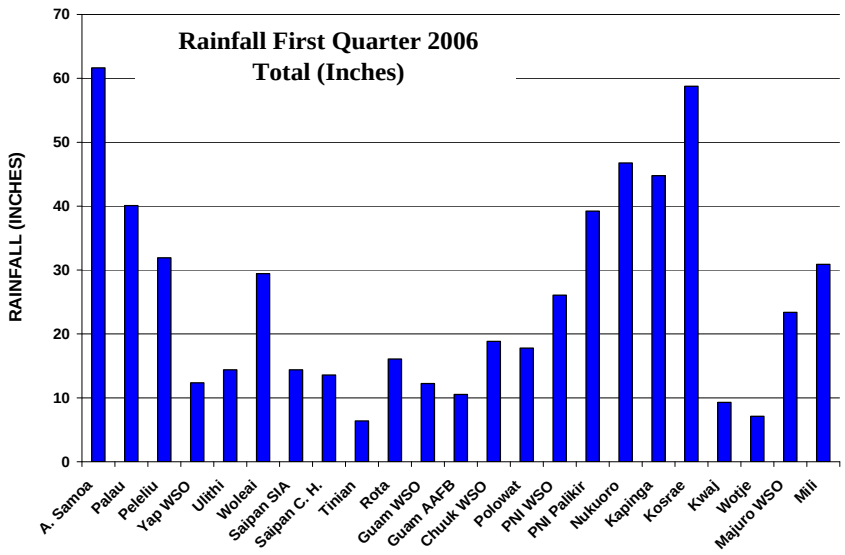
SEA SURFACE TEMPERATURE (SST)

The patterns of anomalous ocean temperatures, atmospheric circulation and precipitation are consistent in indicating weakening La Niña conditions in the tropical Pacific. During March negative equatorial SST anomalies less than –0.5ºC were observed at most locations between 180ºW and 90ºW, and SST departures were near zero in all of the Niño regions, except for Niño 1+2 (along the equatorial Pacific coast of South America). During March and April, positive SST departures decreased in the extreme eastern equatorial Pacific, and appear to be returning to near average in that region. The equatorial subsurface temperature anomaly pattern (negative anomalies in the central and eastern Pacific and positive anomalies in the western Pacific) which persisted during February-March 2006 is diminishing. The latest SST show equatorial SST near average except the negative anomalies near the far eastern Pacific. **These oceanic features are consistent with weakening La Niña conditions and a return to ENSO Neutral conditions**.

SOUTHERN OSCILLATION INDEX (SOI)

During 2005, the SOI trended upward with some large month-to-month variations. During the first months of 2006 the overall positive trend continued with January, February March, and April monthly values of + 1.8, -0.2, + 1.4, and +0.9 With the climate transitioning from weak La Niña to ENSO neutral conditions, the SOI should average near zero (or slightly positive) for the next three to four months, with month-to-month fluctuations within the range of -0.5 to +1.0. The SOI is an index representing the normalized sea level pressure difference between Darwin, Australia and Tahiti (or other sites representative of the western and eastern tropical Pacific, respectively). During El Niño the value of the SOI tends to be negative and during La Niña it tends to be positive.

a)



b)

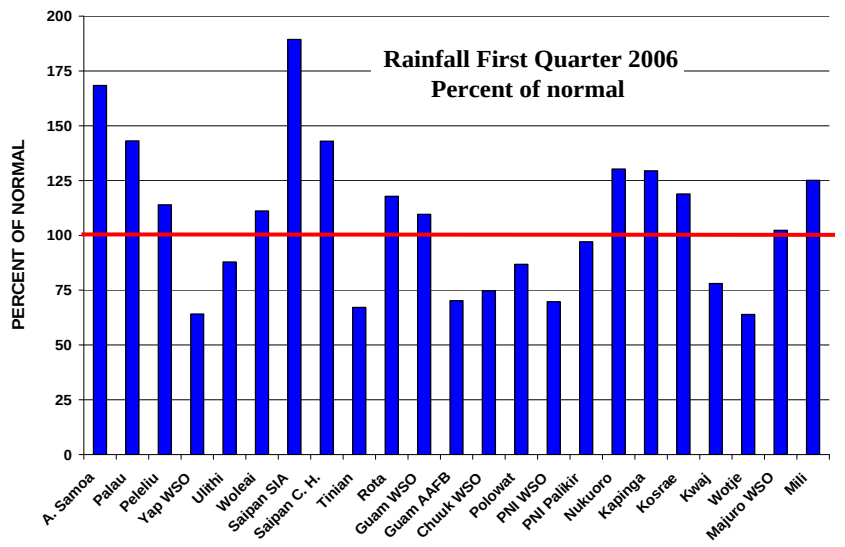


Figure 1. (a) Rainfall totals in inches and **(b)** anomaly (expressed as percent of normal) at the indicated islands for the 1st quarter of 2006.

TROPICAL CYCLONE

TROPICAL CYCLONE OUTLOOK

The PEAC archives western North Pacific tropical cyclone numbers, track coordinates, and 1-minute average maximum sustained wind taken from operational warnings issued by the Joint Typhoon Warning Center (JTWC) of the U. S. Air Force and Navy, located at Pearl Harbor, Hawaii. Western North Pacific tropical cyclone names are obtained from warnings issued by the Japanese Meteorology Agency (JMA), which is the World Meteorological Organization's Regional Specialized Meteorological Center (RSMC) for the western North Pacific basin. The PEAC archives South Pacific tropical cyclone names, track coordinates, central pressure, and 10-minute average maximum sustained wind estimates from advisories issued by the Tropical Cyclone Warning Centers at Brisbane, Nadi, and Wellington. The numbering scheme and the 1-minute average maximum sustained wind estimates are taken from warnings issued by the JTWC. There are sometimes differences in the statistics (e.g., storm maximum intensity) for a given tropical cyclone among the agencies that are noted in this summary.

For purposes of seasonal statistics, the JTWC archives Southern Hemisphere tropical cyclone activity for 2006 within the period July 2005 through June 2006. The first five TCs of in the Southern Hemisphere for the 2006 "season" occurred in the South Indian Ocean during October through early January. In mid-January, the South Pacific experienced its first tropical cyclone – TC 06P (Tam) – that tracked south of Samoa as a weak tropical storm. This TC was soon followed by TC 07P (Urmil) that passed near the Tongan Island group with intensity just shy of hurricane force. The next two Southern Hemisphere TCs – 08S and 09S (Daryl and Bolestse) – were in the South Indian Ocean . To finish off January's Southern Hemisphere TC activity, Cyclone Jim (10P) formed off the east coast of Australia and moved toward Noumea where it dissipated in early February. During the month of February, five TCs occurred in the southern Hemisphere: two in the South Pacific and three in the South Indian Ocean. Cyclone Vaianu (TC 11P) tracked close to Tonga, and small Cyclone Kate meandered for several days close to the southeastern tip of Papua New Guinea. March through April 2006 was a very active period of TC activity in the Southern Hemisphere: four TCs occurred in the South Indian Ocean, and three TCs – Cyclone Larry (17P), Cyclone Wati (18P), and Cyclone Monica (23P) – occurred in the South Pacific. Cyclone Larry made landfall along the northeast coast of Australia near the town of Innisfail. Larry was a major cyclone earning the highest Category 5 intensity classification by the Australian Bureau of Meteorology. Cyclone Monica also peaked at the highest Category 5 intensity while it was in the Gulf of Carpentaria . The 2006 cyclone season of the Southern Hemisphere should wind down soon. So far there has been a total of 23 Southern Hemisphere tropical cyclones numbered by the JTWC within the 2006 cyclone season, compared to a normal seasonal total of 28.

In the Northern Hemisphere, there were two tropical cyclones during the First Quarter of 2006: one in the Arabian Sea (TC 01A) and one in the western North Pacific (TC 01W). TC 01W was not named by the JMA. It spent its entire life at low latitude (near 5ºN), passing south of Koror, Palau in early March, moving westward from there into the Philippine Archipelago where it dissipated. The western North Pacific typically experiences two or three tropical cyclones through April of the calendar year. Early season tropical cyclone activity in the western North Pacific is enhanced during El Niño years, and suppressed in the years that follow El Niño. During La Niña, basin-wide tropical cyclone numbers may be near normal, but the activity is typically shifted to the west.

PEAC TROPICAL CYCLONE OUTLOOK

The preliminary PEAC tropical cyclone outlook for the first half of 2006 is for tropical cyclone development and movement patterns for Micronesia to be displaced toward the west in response to a weakening La Niña. Only Palau and Yap have an increased chance for tropical cyclone activity in this early timeframe, and this activity should be less than typhoon intensity for these islands. During the second half of the year, tropical cyclone activity should trend towards normal except in the eastern half of Micronesia (Pohnpei, Kosrae, RMI) where the threat of a strong tropical storm or a typhoon should be less than average. The western North Pacific typically experiences two or three tropical cyclones through April of the calendar year. Early season tropical cyclone activity in the western North Pacific is enhanced during El Niño years, and suppressed in the years that follow El Niño. During La Niña, basin-wide tropical cyclone numbers may be near normal, but the activity is typically shifted to the west.

LOCAL SUMMARY AND OUTLOOK

American Samoa: The 1st Quarter 2006 rainfall total of 61.64 inches at Pago Pago WSO and 87.97 inches at Aafasaou was much wetter than normal (168% and 165% respectively); compared to stations throughout Micronesia, it was matched only by the approximately 65 inches of rain at Kosrae locations during the 1st Quarter of 2006. Three tropical cyclones tracked close to Tonga during January and February, and these combined with a very active phase of the Australian Northwest monsoon caused enhanced northwesterly winds in Samoa with abundant rainfall. In March, the eastern end of the Australian Northwest Monsoon retreated to the Coral Sea, which shifted the focus of tropical cyclone activity and monsoonal rains to that area and away from Samoa.

America Samoa Rainfall Summary 1st Quarter 2006

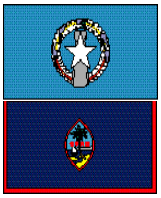
Station		Jan.	Feb.	Mar.	Total
Pago Pago WSO	Rainfall (inches)	23.87	29.27	8.50	**61.64**
	% of Normal	190%	229%	75%	**168%**
Aafasou	Rainfall (inches)	32.05	44.90	11.02	**87.97**
	% of Normal	173%	250%	65%	**165%**

Climate Outlook:

Although American Samoa is nearing the onset of its dry season, computer forecasts and a consensus of outlooks from several regional meteorological centers indicate that rainfall in American Samoa is likely to remain above normal for at least the next three months. Long-range computer rainfall forecasts, however, have only limited skill in the tropical Pacific islands.

One more tropical cyclone may form within the area from Fiji to Samoa in the next two months. Any such cyclone, however, is anticipated to move to the southeast and spare Samoa from any damaging effects. Thus, the threat of a damaging tropical cyclone in any of the islands of American Samoa is essentially over until the next rainy season (2006-07) when a normal distribution of tropical cyclones in the South Pacific region near American Samoa is anticipated. Normal cyclone activity for an entire rainy season indicates that two or three named tropical cyclones would pass to the south of American Samoa producing episodes of heavy rainfall and gale force northwesterly winds.

Inclusive Period	% of long-term average
May - Jun 2006 (End of Rainy Season)	110%
Jul - Sep 2006 (Heart of Next Dry Season)	95%
Oct - Dec 2006 (Onset of next Rainy Season)	100%
Jan - Apr 2007 (Heart of next Rainy Season)	100%



Guam/CNMI: Rainfall on Guam during the 1st Quarter of 2006 was near normal at most locations. This was an artifact of a wet January, a normal February, and a very dry March. Most locations on Guam experienced rainfall totals between 10

LOCAL SUMMARY AND FORECAST

Guam and CNMI Rainfall Summary 1st Quarter 2006

Station		Jan.	Feb.	Mar.	Total
Guam International Airport	Rainfall (inches)	6.80	4.45	0.99	**12.24**
	% of Normal	153%	119%	33%	**110%**
Anderson Air Force Base	Rainfall (inches)	5.00	4.48	1.06	**10.54**
	% of Normal	88%	86%	39%	**70%**
Dededo (Ypapao)	Rainfall (inches)	10.14	5.19	1.43	**16.76**
	% of Normal	183% *	102% *	32%*	**111% ***
Saipan International Airport	Rainfall (inches)	8.33	4.61	1.45	**14.39**
	% of Normal	260%	192%	73%	**189%**
Capital Hill	Rainfall (inches)	6.90	5.15	1.53	**13.58**
	% of Normal	173%	172%	61%	**143%**
Tinian Airport	Rainfall (inches)	3.08	1.90	1.40	**6.38**
	% of Normal	77%	63%	56%	**67%**
Rota Airport	Rainfall (inches)	9.77	5.12	1.18	**16.07**
	% of Normal	185%	110%	32%	**118%**

* % of normal for Dededo are with respect to WSO Finigayan

and 12 inches during the 1st Quarter of 2006, with the highest total in the center of the island where 16.76 inches was recorded in Dededo (most of this – 10.14 inches – occurred in January). By mid-March, the island had dried sufficiently to allow the onset of almost daily wildfires. One large grassfire in the south of Guam on March 12th required evacuations from homes. No homes were damaged, but the fire scorched many acres of grassland and scrub forest.

Except for Tinian, the 1st Quarter rainfall totals at stations in the CNMI were generally slightly higher (approximately 15 inches) than those experienced on Guam (10-12 inches). The monthly distribution of the rainfall in the CNMI was similar to that on Guam where January was very wet, February was not as wet, and March was very dry. During the 1st Quarter of 2006, the Saipan International Airport (SIA) and Capitol Hill experienced 14.39 and 13.58 inches, respectively. These amounts, though relatively small, were high with respect to the typically very low amounts of rainfall in the CNMI during these dry season months.

For most of the 1st quarter of 2006, the Anatahan volcano, located about 90 miles north of Saipan and 200 miles north of Guam, was quiet. During late March and early April it began to

LOCAL SUMMARY AND FORECAST

emit a small plume of steam, gas and volcanic smog (vog). Some very hazy days on Guam and in the CNMI in early April can be traced back to Anatahan, with perhaps a contribution from Asian industrial smog. For the next few months it is possible that meteorological conditions may blow Anatahan vog over the CNMI and Guam, as happened in early April. Consult with the National Weather Service on current wind conditions that may bring Anatahan vog to nearby populated areas. More information on these events and current volcanic activity is available through a USGS and Hawaiian Volcano Observatory website, http://hvo.wr.usgs.gov/cnmi/ .

Climate Outlook:

During La Niña years the tropical cyclone season in the western North Pacific basin is often delayed, and the number of tropical cyclones through mid-July is typically below normal. Also during La Niña years, the site of formation of the basin's tropical cyclones is shifted to the west. For Guam and the CNMI, the typhoon threat is reduced. Thus, during all of 2006 (and especially during the months of September through December) two or three tropical storms and one or two typhoons should pass within 200 miles of any Guam and CNMI location. The odds of typhoon force winds (or greater) at any location on Guam or in the CNMI during any given year (status of ENSO not considered) are approximately 1 in 7. During El Nino years, the odds of typhoon force winds on Guam or on any individual island in the CNMI rise to about 1 in 3. During non-El Nino years the odds fall back to around 1 in 10. Dangerous surf from a typhoon does not require that the typhoon pass close to any location, so it is certain that at least one episode of dangerous typhoon-generated waves will occur. Every year several lives are lost due to hazardous surf and the rip currents produced by them.

Rainfall is anticipated to be below normal for Guam and the CNMI during May and June, and then return to near normal thereafter. Predicted rainfall for the Mariana Islands from May 2006 through April 2007 is as follows:

Inclusive Period	% of long-term average	
	Guam/Rota	Saipan/Tinian
May -Jun 2006 (End of Next Dry Season)	85%	80%
Jul - Oct 2006 (Heart of Rainy Season)	100%	95%
Nov - Dec 2006 (Onset of Next Dry Season)	110%	100%
Jan - Apr 2007 (Heart of Next Dry Season)	100%	100%

Federated States of Micronesia

Yap State: The total 1st Quarter 2006 rainfall at the WSO on Yap Island was below normal at 12.36 inches (64%). All other recording locations on Yap Island were wetter than at the WSO, with 1st Quarter rainfall totals generally between 15 to 20 inches. The highest 1st Quarter rainfall recorded on Yap Island was the 19.89 inches (103%) measured at Tamil. In all of Yap State, the highest 1st Quarter rainfall total of 29.43 inches (111%) was recorded at Woleai, which (at its more southern location) is normally wetter.

LOCAL SUMMARY AND FORECAST

Yap State Rainfall Summary 1st Quarter 2006

Station		Jan.	Feb.	Mar.	Total
Yap WSO	Rainfall (inches)	4.49	3.33	4.54	**12.36**
	% of Normal	61%	56%	76%	**64%**
Dugor*	Rainfall (inches)	4.64	5.78	5.93	**16.35**
Gilman*	Rainfall (inches)	5.81	3.20	6.40	**15.41**
Luweech*	Rainfall (inches)	5.21	2.98	5.91	**14.10**
Maap*	Rainfall (inches)	7.86	6.06	3.70	**17.62**
North Fanif*	Rainfall (inches)	6.03	6.04	5.02	**17.09**
Rumung*	Rainfall (inches)	6.33	5.92	5.30	**17.55**
Tamil*	Rainfall (inches)	7.39	6.26	6.24	**19.89**
Ulithi	Rainfall (inches)	2.84	4.43	7.12	**14.39**
	% of Normal	46%	87%	140%	**88%**
Woleai	Rainfall (inches)	15.99	2.70	10.74	**29.43**
	% of Normal	150%	36%	129%	**111%**

* Long term normal is not established for these sites.

Climate Outlook:

The tropical cyclone threat for Yap during 2006 should be near normal, with the greatest threat occurring in the months of September through December. One or two tropical storms may form near Yap during May through July of 2006 bringing heavy rainfall. In the latter half of 2006, approximately 2 or 3 tropical cyclones should pass close enough to Yap (and/or its outer islands) to cause gales. While we expect no direct strikes by a typhoon of any island or atoll of Yap State during 2006, residents should always be prepared for the possibility.

Predicted rainfall for Yap State from May 2006 through April 2007 is as follows:

Inclusive Period	% of long-term average	
	Yap and Ulithi	Woleai
May – Jun 2006 (Onset of Rainy Season)	90%	110%
Jul - Oct 2006 (Heart of Rainy Season)	110%	110%
Jun – Aug 2006 (Onset of Dry Season)	100%	100%
Jan - Apr 2007 (Next Dry Season)	100%	110%

Chuuk State: There was a north-south gradient of rainfall across the islands of Chuuk State during the 1st Quarter of 2006, with the islands located further south generally experiencing more rainfall than those islands and atolls further north. With respect to the Chuuk WSO, only recording locations to its north (for example, Fananu and Onoun) were

LOCAL SUMMARY AND FORECAST

drier, while other locations to the south (for example, Ettal and Ta) were substantially wetter. The WSO Chuuk had 18.84 inches (75% of normal) during the 1st Quarter of 2006. February was particularly dry in some locations. During the 1st Quarter, the Mortlock stations were the wettest in Chuuk State. Some recording locations within the Chuuk Lagoon and in the northern atolls received 1st Quarter rainfall totals less than 15 inches.

Climate Outlook:

The tropical cyclone threat for 2006 should be near normal, with the greatest threat occurring in the months of September through December. One or two tropical depressions may form within Chuuk State during May and June of 2006 bringing heavy rainfall, but then moving northwestward out of Chuuk State before becoming tropical storms. In the latter half of 2006, approximately 2 or 3 tropical cyclones should pass through Chuuk State causing gales to some islands and heavy rainfall throughout most of the region. While we expect no direct

Chuuk Rainfall Summary 1st Quarter 2006

Station		Jan.	Feb.	Mar.	Total
Chuuk Lagoon					
Chuuk WSO	**Rainfall (inches)**	5.76	5.27	7.81	**18.84**
	% of Normal	54%	85%	94%	**75%**
Piis Panew*	**Rainfall (inches)**	4.52	2.60	4.06	**11.18**
Xavier High School*	**Rainfall (inches)**	5.67	4.20	8.62	**18.49**
Southern Mortlocks					
Lukunoch*	**Rainfall (inches)**	10.10	3.73	8.66	**22.49**
Ettal*	**Rainfall (inches)**	11.59	6.36	6.88	**24.83**
Ta*	**Rainfall (inches)**	12.26	7.46	8.87	**28.59**
Northern Atolls					
Fananu*	**Rainfall (inches)**	6.65	2.04	5.90	**14.59**
Onoun*	**Rainfall (inches)**	6.43	2.09	4.84	**13.21**
Northern Morlocks					
Losap*	**Rainfall (inches)**	6.83	3.05	11.45	**21.33**
Nama*	**Rainfall (inches)**	7.71	4.77	14.27	**26.75**
Western Atolls					
Polowat	**Rainfall (inches)**	4.24	7.66	5.89	**17.79**
	% of Normal	53%	123%	94%	**87%**

* Long term normal is not established for this site

LOCAL SUMMARY AND FORECAST

strikes by a typhoon of any island or atoll of Chuuk State during 2005, residents should always be prepared for the possibility.

The rainfall at most Chuuk locations was less than anticipated for the 1st Quarter of 2006; this was primarily due to very dry conditions in February 2006. The trade wind trough should migrate slowly northward in May. Thus, abundant rains should eventually overspread all of Chuuk, beginning first with atolls located furthest south and working northward to the northern atolls by the end of May. Rainfall at islands and atolls of the Chuuk Lagoon and on the other atolls of Chuuk State should be slightly wetter than normal during the second half of 2006.

Predictions for Chuuk State from May 2006 through April 2007 are as follows:

Inclusive Period	% of long-term average			
	Chuuk Lagoon, Losap, & Nama	Polowat	Hall Is.	Mortlocks
May - Jun 2006	100%	105%	100%	95%
Jul - Sep 2006	110%	115%	110%	115%
Oct - Dec 2006	110%	110%	100%	110%
Jan - Apr 2007	100%	100%	90%	120%

Pohnpei State: There was a north-south gradient of rainfall across the islands of Pohnpei State during the 1st Quarter of 2006, with the islands located further south generally experiencing more rainfall than those islands and atolls further north. With respect to the Pohnpei WSO, most recording locations on Pohnpei Island and at all other recording locations in the outer islands of Pohnpei State received more rain. The 1st Quarter rainfall total of 46.76 inches at Nukuoro was the

Pohnpei Rainfall Summary 1st Quarter 2006

Station		Jan.	Feb.	Mar.	Total
Pohnpei Island					
Pohnpei WSO	**Rain (inches)**	9.24	8.88	7.96	**26.08**
	% of Normal	71%	82%	59%	**70%**
Palikir*	**Rain (inches)**	16.66	11.49	11.07	**39.22**
Atolls of Pohnpei State					
Nukuoro	**Rain (inches)**	17.96	10.12	18.68	**46.76**
	% of Normal	153%	96%	137%	**130%**
Pingelap	**Rain (inches)**	17.89	7.98	9.21	**35.08**
	% of Normal	145%	65%	64%	90%
Mwokilloa	**Rain (inches)**	11.66	6.15	8.61	**26.42**
Kapinga-marangi	**Rain (inches)**	13.45	16.98	14.35	**44.78**
	% of Normal	129%	165%	103%	**129%**

* Long term normal is not established for this site

LOCAL SUMMARY AND FORECAST

highest reading in Pohnpei Stare, followed by 44.78 inches at Kapingamarangi. Kapingamarangi has been wetter than normal for a long time, and continued to be very wet through the 1st Quarter of 2006. At most locations throughout Pohnpei State, the month of February was the driest of the first three months of 2006. Pohnpei Island would have had an even drier February if it weren't for heavy rains at the end of the month.

Climate Outlook:

With ENSO neutral conditions following the earlier weak La Nina conditions this year, the risk of a damaging tropical storm or typhoon would be very unlikely at any island in Pohnpei State during 2006. The very early stages of developing tropical cyclones may bring some episodes of heavy rain to Pohnpei, but these systems should not become tropical storms or typhoons until well away from Pohnpei.

Primarily as a result of very dry conditions in February 2006, the rainfall at most Pohnpei locations was less than anticipated for the 1st Quarter of 2006. The rainfall at Kapingamarangi, however, continued to exceed expectations. The trade wind trough should migrate slowly northward in April and May. Thus, abundant rains should continue on atolls located farthest south and reach Pohnpei Island by May. Predicted rainfall for Pohnpei State from May 2006 through April 2007 is as follows:

Inclusive Period	% of long-term average	
	Pohnpei Islands/ Atolls	Kapingamarangi
Apr- Jun 2006	110%	110%
Jul - Sep 2006	100%	100%
Oct - Dec 2006	110%	95%
Jan - Apr 2007	100%	95%

Kosrae State: There was a very sharp north-south gradient of rainfall across Micronesia during the first three months of 2006, and at the latitude of Kosrae (5.3º N), there was abundant rainfall (60 inches), with amounts falling off to the north (Kwajalein, at approximately 9º N, had only 9.28 inches of rain during these three months.) The 1st Quarter 2006 rainfall values recorded on Kosrae were the highest in Micronesia, and were above normal for this normally very wet island. The 1st Quarter total of 58.76 inches at Kosrae Supplemental Aviation Weather Reporting Station (SAWRS) (located at the airport on the north side of the island) was 119% of normal. At other locations on the island it was even wetter with over 60 inches recorded at Utwa and at Tofol.

Kosrae State Rainfall Summary 1st Quarter 2006

Station		Jan.	Feb.	Mar.	Total
Kosrae Airport (SAWRS)	Rainfall (inches)	24.94	9.00	24.82	**58.76**
	% of Normal	173%	55%	133%	**119%**
Utwa*	Rainfall (inches)	27.22	10.25	24.73	**62.20**
Tofol*	Rainfall (inches)	30.54	*10.00* **	28.29	**68.83**
Nautilus*	Rainfall (inches)	25.72	7.67	*25.00* **	**58.39**

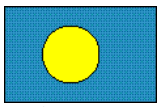
* Long term normal is not established for these sites.
** Estimated

LOCAL SUMMARY AND FORECAST

Climate Outlook:

With ENSO neutral conditions following the earlier weak La Nina conditions this year, the risk of a damaging tropical storm or typhoon would be very unlikely at Kosrae during 2006. The very early stages of developing tropical cyclones may bring some episodes of heavy rain to Kosrae, but these systems should not become tropical storms or typhoons until they are well away from Kosrae. Predicted rainfall for Kosrae State from May 2006 through April 2007 is as follows:

Inclusive Period	% of long-term average
May - Jun 2006	115%
Jul - Dec 2006	100%
Jan - Apr 2007	110%



Republic of Palau: The rainfall distribution in Micronesia during the 1st Quarter was characterized by a sharp north-south gradient (north dry, south wet) superimposed on a gradual east-west gradient (east dry, west wet) related to La Niña circulation anomalies and an active Australian Northwest Monsoon. When the Australian Northwest Monsoon was very active during February, it reduced the rainfall throughout much of Micronesia. At its location further south than many islands of Micronesia, and also furthest to the west, Palau had abundant rainfall in the 1st Quarter of 2006. The month of February (when the Australian Monsoon was very active) was the driest of the three months on Palau. The WSO Koror had 1st Quarter 2006 rainfall total of 40.09 inches that was 143% of normal. 1st Quarter rainfall amounts were not quite so heavy at Nekken (35.93 inches), and at Peleliu (31.93 inches), but were somewhat higher only a few miles away at the Palau International Airport (46.58").

Republic of Palau Rainfall Summary 1st Quarter 2006

Station		Jan.	Feb.	Mar.	Total
Koror WSO	Rainfall (inches)	21.43	7.93	10.73	**40.09**
	% of Normal	200%	87%	131%	**143%**
Nekken*	Rainfall (inches)	14.44	9.33	12.16	**35.93**
International Airport*	Rainfall (inches)	26.45	7.56	12.57	**46.58**
Peleliu*	Rainfall (inches)	13.34	10.47	8.12	**31.93**

* Long term normal is not established for these sites.

Because of the strong westward shift in tropical cyclone formation during 2005 and early 2006, Palau was in the path of some of the few tropical disturbances that moved from western Micronesia towards the Philippines. One disturbance became the first numbered tropical cyclone of 2006 (TC 01W), which passed well south of Koror, Palau in early March. This tendency should continue, with Palau experiencing episodes of heavy rains from tropical disturbances in the next few months.

LOCAL SUMMARY AND FORECAST

Climate Outlook:

La Niña conditions that persisted through the beginning of 2006 should push the formation region of tropical cyclones westward, and Palau will likely be affected by many tropical disturbances that will contribute to abundant rainfall. In general, most tropical storms and typhoons that move past Palau stay well to the north, but westerly gales, heavy rain showers, and rough seas are often experienced as they move by. During 2006, there should be several episodes of heavy rainfall and 2 or 3 occurrences of gusty westerly winds and rough seas from tropical cyclones passing to the north, as the focus of the basin's tropical cyclone activity is shifted to the west of normal.

Rainfall throughout Palau is anticipated to be wetter than normal for most months of the year. Predicted rainfall for Palau from May 2006 through April 2007 is as follows:

Inclusive Period	% of long-term average
May - Jun 2006	110%
Jul - Sep 2006	100%
Oct - Dec 2006	110%
Jan - Apr 2007	120%

Republic of the Marshall Islands (RMI): There was a large north-south gradient of rainfall in the RMI during the 1st Quarter of 2006, with the northern RMI experiencing very dry conditions and areas of the southern RMI experiencing abundant rainfall. The northern atolls of the RMI (Kwajalein , Utirik and Wotje) were among the driest of locations in Micronesia during the 1st Quarter of 2006, with 3-month totals at each island of less than 10 inches. Some of the central and southern atolls, however, were wet (e.g., Mili had a 1st Quarter total of 30.90 inches). Extremely dry conditions at Majuro during most of February resulted in mandatory water rationing. Over 5 inches of rain in one day at the end of February contributed almost the entire monthly rainfall total of 6.38 inches at the Majuro WSO.

RMI Rainfall Summary 1st Quarter 2006

Station		Jan.	Feb.	Mar.	Total
RMI Central and Southern Atolls					
Majuro WSO	Rainfall (inches)	10.50	6.38	6.51	**23.39**
	% of Normal	126%	104%	79%	**102%**
Laura*	Rainfall (inches)	6.37	4.68	4.09	**15.14**
Arno*	Rainfall (inches)	10.81	7.05	6.75**	**24.61**
Ailinglaplap	Rainfall (inches)	9.97	7.03	9.05	**26.05**
Mili	Rainfall (inches)	11.92	6.44	12.54	**30.90**
RMI Northern Atolls					
Kwajalein	Rainfall (inches)	5.06	1.15	3.07	**9.28**
	% of Normal	111%	36%	75%	**78%**
Utirik	Rainfall (inches)	0.45	0.35	1.66	**2.46**
	% of Normal	12%	13%	48%	**24%**
Wotje	Rainfall (inches)	3.22	0.42	3.48	**7.12**
	% of Normal	74%	14%	89%	**64%**

* Long term normal is not established for this site

** Estimated

LOCAL SUMMARY AND FORECAST

Climate Outlook:

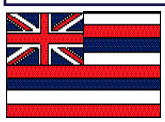
With ENSO neutral conditions following the earlier weak La Niña conditions this year, tropical cyclones in the western North Pacific basin should continue to form west of normal for the whole year. Thus, the RMI has a very low risk of a typhoon during 2006.

The northern atolls of the RMI should be drier than normal through June 2006, and the central and southern atolls should have adequate rainfall. The trade wind trough is firmly established over southern Micronesia , and rainfall should be abundant for most areas south of 8 ° N by the end of April and for areas north of 8 ° N by June. Residents in the northern Marshall Islands are encouraged to conserve water until near normal rains return in late June or early July.

Predicted rainfall for the RMI from May 2006 through April 2007 is as follows:

Inclusive Period	% of long-term average		
	S. of 6°N	6°N to 8°N	N. of 8°N
May 2006 - Jun 2006	100%	110%	80%
Aug - Dec 2006	100%	110%	95%
Jan - Apr 2007	110%	100%	90%

USAPI Rainfall normals and predicted rainfall outlooks are provided by University of Guam WERI.



Hawaii: The winter wet season of 2005-2006 started off extremely dry across Hawaii as a strong jet stream persisted across the north Pacific, keeping all significant rain makers well to our north. December 2005 was the driest December on record for Lihue, with only 0.08 inches (normal is 4.8 inches). Even normally wet Mt Waialeale on Kauai received only 1.67 inches (normal is over 45 inches). This pattern broke down in early February as the jet stream across the Pacific weakened, likely in concert with a developing weak La Nina pattern, and allowed storm systems to move much farther south. Normally during March, Hawaii will see several strong trade wind events and shear line passages with considerable rainfall over the windward, or north- and east-facing, slopes of the islands. Instead, March 2006 brought only 5 days of low level winds from a trade direction with the remainder being from the southeast through southwest due to the persistent pattern of low pressure to our west. It was not a single low that persisted for nearly 7 weeks, but rather a series. Several stations

LOCAL SUMMARY AND FORECAST

(Waimanalo, Pahala, Moloaa) broke their March record and Lihue had its wettest month ever.

This unprecented wet period created severe flooding throughout the state and devastating property damage throughout the month. The Honolulu Forecast Office issued

Hawaii State Rainfall Summary* 1st Quarter 2006

Station		Jan.	Feb.	Mar.	Total
Lihue Airport	**Rainfall (inches)**	1.88	8.64	36.13	**46.65**
	% of Normal	41%	265%	1009%	**406%**
Honolulu Airport	**Rainfall (inches)**	1.53	2.62	16.98	**21.13**
	% of Normal	56%	111%	898%	**302%**
Kahului Airport	**Rainfall (inches)**	0.74	0.69	4.17	**5.60**
	% of Normal	20%	29%	177%	**66%**
Hilo Airport	**Rainfall (inches)**	11.43	8.46	26.41	**46.30**
	% of Normal	117%	95%	184%	**140%**

* More rainfall stations are in the NOAA NWS Hawaii Precipitation Summaries at http://www.prh.noaa.gov/hnl/pages/hydrology.php

LOCAL SUMMARY AND FORECAST

111 flash flood warnings from Feb 19th-Apr 2nd; typically only **2-3** are issued during this time period. In addition there were landslides, heavy winds and tornados. The repeated heavy rainfall stressed many of the reservoirs throughout the state. On March 14th, Ka Loko Dam on Kauai failed. The wall of water swept away homes and structures and resulted in 3 confirmed deaths and 4 persons missing. Our condolences go out to the families and friends affected by this tragedy.

This information was taken from the NOAA NWS Unprecedented Extended Wet Period across Hawaii event summary. For more detailed information and the full event summary go to http://www.prh.noaa.gov/hnl/pages/events/weeksrain/weeksrainsummary.php.

Climate Outlook:

According to the Climate Prediction Center's official forecast for Hawaii, dynamical and statistical tools predict a tendency towards below normal temperatures from JJA (June-July-August) 2006 to ASO (August-September-October) 2006. Dynamical and statistical tools also indicate a tendency towards above median precipitation from MJJ 2006. For the MJJ all four Hawaii stations (Hilo , Kahului, Honolulu and Lihue) have a 40% chance of having above normal rainfall. Honolulu and Lihue have a 40% chance of having above normal rainfall for JJA and ASO; Kahului and Hilo have an equal chance of below normal rainfall, near normal rainfall and above normal rainfall for JJA and ASO.

NEW – Experimental Sea level Forecasts *(deviations with respect to climatology)* for the U.S-affiliated Pacific Islands

The following sections describe: (i) the CCA-based forecasts for sea level deviations for the forthcoming season, and (ii) the observed monthly sea level deviations. All units are in inches. Note that the forecasting technique adapted here does not account for sea level deviations created by other atmospheric or geological conditions such as tropical cyclones, storm surges or tsunamis.

Seasonal Sea Level Forecast for AMJ. MJJ, and JJA2006

Forecasts of the sea level anomalies in the USAPI are presented using CCA statistical model. Locations of all stations are shown in **Fig. 2**. Based on the independent SST values in JFM 2006 *(for SST data, see http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCDC/.ERSST/.version2/.SST/)*, the resulting CCA model was used to forecast the sea level of three consecutive months: Apr-May-Jun (AMJ), May-Jun-Jul (MJJ), and Jun-Jul-Aug (JJA) (**Table 1**).

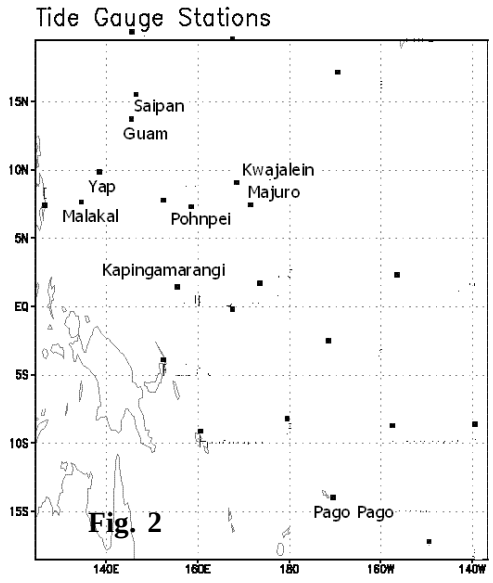


Fig. 2

As in the previous season (JFM), this season (AMJ) also provided very skillful forecasts. Most of the tide gauge stations show strong skill level (**Table 1**). Only Guam , Malakal, and Yap of north Pacific displayed a relatively lower skill, which is still, however, reasonably well predicted (skill level of 0.5 or more). The majority of the tide gauge stations in a ll the three consecutive months (AMJ, MJJ, JJA) are very well predicted with a mean skill greater than 0.60 (at 0 to 2-month lead time).

Results of the CCA model forecasts revealed that all the tide gauge stations are likely to experience rise in the forthcoming seasons AMJ, MJJ, and JJA (**Table 1**). This rising trend has also been observed consistently in all the islands located in the vicinity of north-west, north-east, and South Pacific Ocean . However, it is also worth noting here that the central part of the western Pacific (Pohnpei, Majuro, and Kwajalein) displayed relatively less positive deviations, as compared to others. The higher positive deviation has been observed in the north-western part of Pacific (Guam, Malakal, and Yap). Following this trend, a trend of moderately positive deviations was observed in the central part (Pohnpei, Kapingamarangi, and Majuro). Finally, a higher positive deviation was observed again in the

NEW – Experimental Sea level Forecasts (con't)

Table 1: Forecasts of sea level deviation in inches (AMJ: Apr-May-Jun, MJJ: May-Jun-Jul, JJA: Jun-Jul-Aug)

Tide Gauge	AMJ	MJJ	JJA	Forecast Quality[1]
Lead time[2]	*0*	*1M*	*2M*	
Guam	+7	+7	+7	Good
Malakal	**	+1	+3	Good
Yap	+3	+5	+5	Good
Pohnpei	+4	+3	+2	Strong
Kapingamar	+3	+2	+2	Very Strong
Majuro	+2	**	**	Strong
Kwajalein	+4	+4	+3	Strong
Pago Pago	+4	+4	+4	Very Strong

Note: (-) indicates negative deviations (fall of sea level from the mean), and (+) indicates positive deviations (rise of sea level from the mean), N/A: data not available. Deviations of less than +/-1 in. are considered negligible and denoted by **. Deviations +/- 2 in. are unlikely to cause any adverse climatic impacts.

1. Forecast quality is a measure of the expected CCA cross-validation correlation skill. In general terms, these forecasts are thought to be of useful skill (or at least fair skill) if the CCA cross-validation value is greater than 0.3. Higher skills correspond to greater expected accuracy of the forecasts. For more information go to the website at http://www.soest.hawaii.edu/MET/Enso/peu/2006_2nd/Sea_Level.htm

2. The lead time is the time interval between the end of the initial period and the beginning of the forecast period. For example, lead-0, lead-1M, and lead-2M means 'sea-level' of target season 0, 1, and 2 month leads based on SSTs of previous JFM.

vicinity of South Pacific Ocean (Pago Pago).

The forecast values of sea-level—which determines rise in most of the tide-gauge stations—is consistent with the La Niña conditions present in the tropical Pacific in the beginning of the year.

Observed monthly sea level deviation in Jan-Feb-Mar (JFM), 2006

The monthly time series (Jan to March) for sea level deviations have been taken from the UH Sea Level Center. The full time series (in mm) is available at: ftp://ilikai.soest.hawaii.edu/islp/slpp.deviations. Deviations are defined here as the difference between the mean sea level for the given month and the 1975 through 1995 mean sea level value computed at each station.

Table 2 provides the monthly observed sea level deviations (in inches). **Table 2** provides the monthly observed sea level deviations (in inches). Except Yap , all other tide gauge stations recorded a trend of positive deviations in most of the months in this quarter (1st quarter of 2006) (**Table 2**). Among others, Guam recorded considerable rise in this quarter (7.6 inches, 8.3 inches, and 11.1 inches in January, February, and March respectively). After a slight recession in October and November 2005, Guam again started rising from December 2005. Yap, on the other hand, did not record any major changes in this quarter. Pago-Pago in the south Pacific recorded a rise during January. It may be mentioned here that the sea-level variation in the northwestern tropical Pacific islands has been identified to be sensitive to ENSO cycle, with low sea level during El Niño and high sea level during La Niña events. As mentioned, consistent with the La Niña conditions , the sea level has been found to be higher than average during JFM.

In the last quarter's issue, our forecasts provided positive deviations for all the tide gauge stations in JFM (***Fig #2 dotted line***). Negligible variations were predicted in Malakal and Yap . Real-time observed sea-level data in JFM provided consistency with the forecast values (**Fig. 2**). In all cases, the direction of the deviations—either positive or negative— has been found to match all the forecasts. In addition, the quantitative values of these forecasts were very close to the real-time observed values (with the exception of Guam and Makalal).

Table 2: Monthly observed sea level deviations in inches (year to year monthly std deviation in parentheses)

Tide Gauge	Jan.		Feb.		Mar	
	Dev.	SD	**Dev.**	SD	**Dev.**	SD
Guam	**+7.6**	(4.2)	**+8.3**	(4.3)	**11.1**	(4.6)
Malakal	**-0.3**	(4.9)	**+1.1**	(5.1)	**+8.7**	(4.6)
Yap	**-0.6**	(4.0)	**0.0**	(3.9)	**-0.8**	(4.1)
Kwajalein	**+5.0**	(3.2)	**+5.7**	(2.4)	**+6.2**	(2.1)
Majuro	**+3.5**	(3.4)	**+6.2**	(2.2)	**+4.3**	(1.7)
Pohnpei	**+4.2**	(4.5)	**+5.9**	(3.1)	**+4.3**	(2.3)
Kapingamar.	**+6.5**	(3.8)	**+6.4**	(3.0)	**+5.2**	(3.5)
Pago Pago	**+3.9**	(1.8)	**N/A**	(2.8)	**N/A**	(3.5)

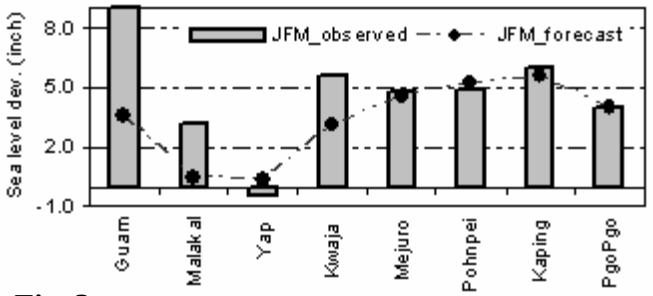


Fig. 3: Average observed/forecasted seasonal sea level deviations for Jan-Feb-Mar

Note: - indicates negative deviations (fall of sea level from the mean) and + indicates positive deviations (rise of sea level from the mean)
N/A: data not available.

Trends in sea level extremes in the USAPI

by Dr. Rashed Chowdhury, PEAC Researcher

The following three paragraphs are taken from US National Assessment of the Potential Consequences of Climate Variability and Change Educational Resources Regional Paper: US-Affiliated Islands of the Pacific and Caribbean—Sea Level Variability available at <http://www.usgcrp.gov/usgcrp/nacc/education/islands/islands-edu-6.htm>

"Sea-level rise and the associated erosion and inundation problems are currently extremely important issues for many of the US-Affiliated islands. There are three factors that affect the impacts of sea-level rise on islands: the natural amount of sinking and rising of the individual islands (due to plate tectonics); the rate and extent of global sea-level rise; and the occurrence of periodic events, such as extreme lunar tides, ENSO related changes, and storm-related wave conditions.

Many of the projected consequences of long-term sea-level rise, such as salt water intrusion into freshwater lenses and coastal erosion are already problems in some if not most island jurisdictions. Climate-related changes of these conditions are seen, therefore, as magnifying existing problems rather than as problems in isolation from other stresses. Island communities must deal with these problems today and, in so doing, can develop important insights into how they might most effectively respond to climate-related changes in sea level over both the short- and long-term.

Long-term global rates of sea-level rise are projected to be 2 to 5 times faster in the 21st century than during the 20th century. In addition to considering only the consequences of a gradual, long-term rise in sea level, island communities will continue to face short-term sea level changes as well. In some locations in the Pacific, temporary rises in sea level from storms, lunar tides, and ENSO events raise the sea level even higher than is projected for the next century. Future sea-level rise, both global and periodic (because increasing global sea level will also raise the level from which temporary events occur), will increasingly contribute to negative consequences for populations and ecosystems."

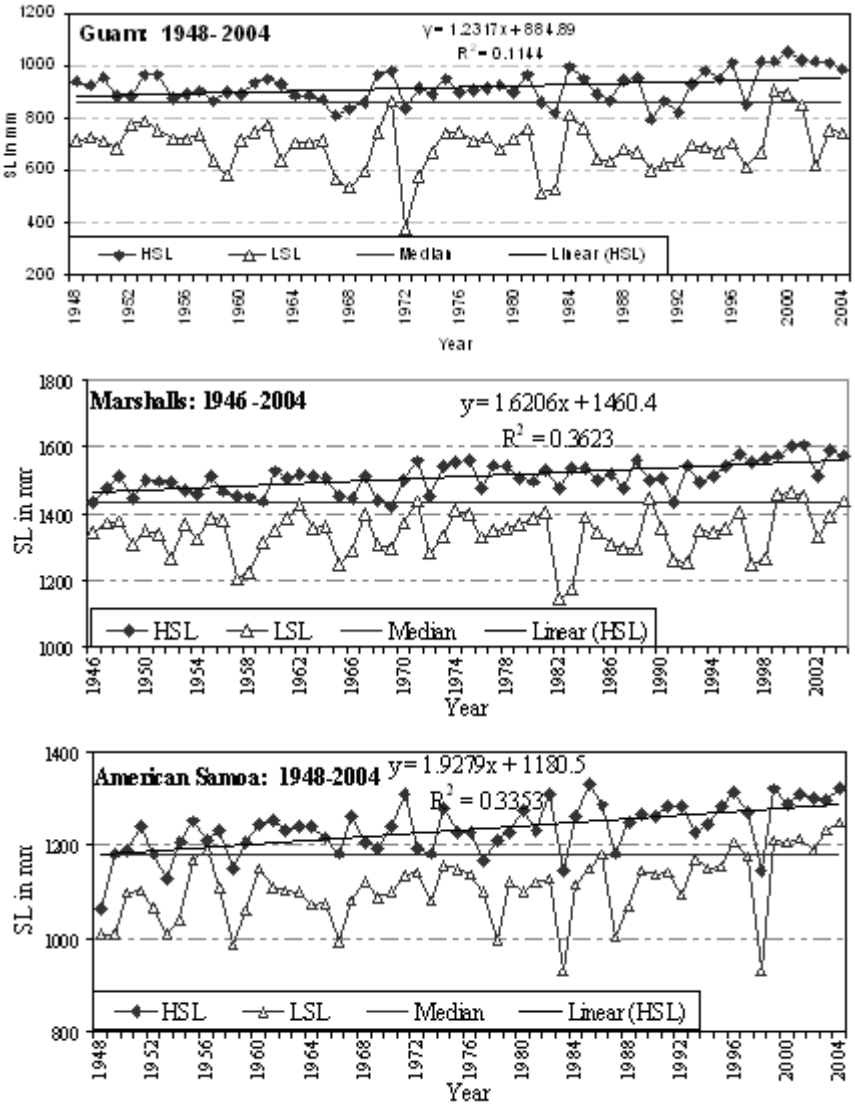


Figure 4. Annual maxima sea levels (HSL), minima sea levels (LSL), and median sea levels in mm for Guam, Majuro RMI and Pago Pago AS.

In **Figure 4** (above), the annual maximum sea level (HSL) shows a significant increasing trend with the increase being concentrated in the later half of 20th century. Annual variability shows an apparent trend with the most pronounced increase occurring in the 1960s and 1970s. The linear regression fitted to the data of the annual maximum show an increase in the maximum on the USAPI during the last 50 years. The last 60 years' data suggest that the maxima has increased by about fourteen centimeters in Guam, sixteen centimeters in Marshalls, and ten centimeters in American Samoa. However, according to the aforementioned paper, it should be mentioned that the relative sea level (RSL) at some tide gauges has been observed to be falling. This is due of a) the short time series used to compute the trend (interannual and decadal fluctuations can mask longer term trends), and b) land motion at the tide gauge. The uncertainty of these values is reflected in their high error bars and in many cases is larger than the trend estimate itself.

Pacific ENSO Update

Receive Pacific ENSO Update notifications by email:
Go to PEAC website **http://www.soest.hawaii.edu/MET/Enso** and click on subscribe to recieve notification of when the PEAC newsletter is available online.

ENSO FORECAST

Excerpt from PROGNOSTIC DISCUSSION FOR LONG-LEAD OUTLOOKS
NOAA NWS -Climate Prediction Center- Camp Springs, MD- 8:30 am EST Thursday May 18, 2006
http://www.cpc.ncep.noaa.gov/products/predictions/long_range/fxus05.html

The current patterns of anomalous ocean temperatures are consistent in indicating a return to ENSO-neutral conditions in the tropical Pacific. During April SSTs were close to average at most locations between Indonesia and 90W, which is reflected in the near zero departures observed in all of the Niño regions, except for Niño 1+2. During the month, negative SST departures developed in the extreme eastern equatorial pacific, which is a reversal from conditions observed during February-March.

During April above-average precipitation (negative OLR anomalies, was observed over portions of Indonesia and northern Australia, while below-average precipitation (positive OLR anomalies) was observed over the central equatorial pacific and the eastern tropical Pacific between the equator and 20N. Slightly stronger-than-average low-level (850 hpa) easterly winds persisted over the central equatorial pacific, and anomalous upper-level (200-hpa) cyclonic circulation centers were observed in both hemispheres. Although these atmospheric features are lingering effects of La Niña, they are weaker than in previous months. Since February the basin-wide upper ocean heat content has increased, becoming slightly positive in April. Collectively, these atmospheric and oceanic features signal the demise of La Niña and a return to ENSO-neutral conditions.

Most of the statistical and coupled models predict ENSO-neutral conditions in the tropical pacific through the end of 2006. However, the spread of these forecasts (weak La Nina to weak El Niño) indicates considerable uncertainty in the outlook for the last half of the year.

EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION
issued by NOAA NWS Climate Prediction Center-May 11, 2006
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/

***Synopsis**: ENSO-neutral conditions are expected to prevail during the next 3-6 months.*

ACKNOWLEDGEMENTS and FURTHER INFORMATION:

PACIFIC ENSO APPLICATIONS CENTER:
HIG #350, 2525 Correa Road, Honolulu, Hawaii 96822
Contact Nicole Colasacco at 808-956-2324 for more information on the *Pacific ENSO Update* and ENSO-related climate data for the Pacific Islands.
Contact Dr. R. Chowdhury at 808-956-2324 for more information on ENSO and sea level variability in the USAPI.

University of Guam (UOG)
WATER AND ENERGY RESEARCH INSTITUTE (WERI):
UOG Station, Mangilao, Guam 96923
Contact Dr. M. Lander at 671-735-2685 for information on tropical cyclones and climate in the Pacific Islands.

NOAA National Weather Service-Pacific Region
WEATHER SERVICE FORECAST OFFICE (WSFO)
3232 Hueneme Road, Barrigada, Guam, 96913
Contact C. Guard at 671-472-0900 for further information on tropical cyclones and climate in the Pacific Islands.

University of Hawaii (UH) School of Ocean and Earth Science and Technology (SOEST)
DEPARTMENT OF METEOROLOGY:
HIG #350, 2525 Correa Road, Honolulu, Hawaii 96822
Contact Dr. T. Schroeder at 808-956-7476 for more information on hurricanes and climate in Hawaii.